PREDICTIVE CODING DEVICE AND PREDICTIVE DECODING DEVICE

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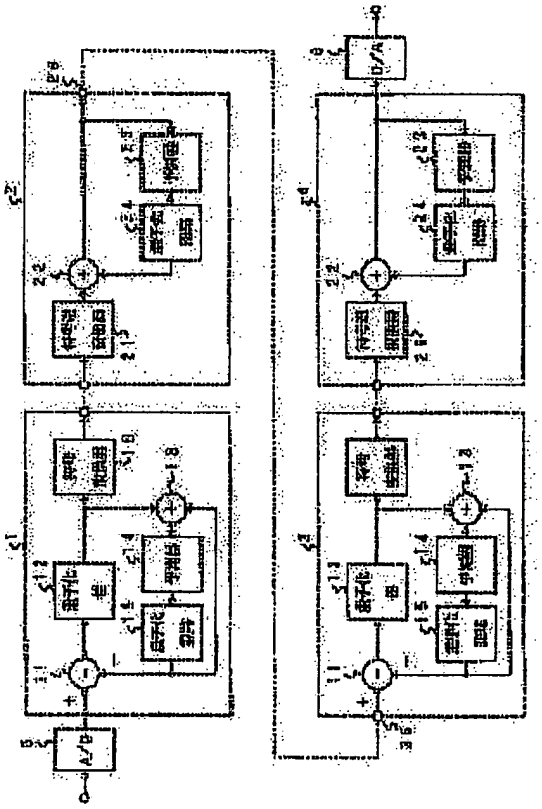
Abstract of **JP 8322047 (A)**

PURPOSE: To provide a predictive coding device capable of excluding a quantize noise by predictive coding to be accumulated when predictive coding/decoding is repeated in a second or subsequent stages in an image signal predictive-coded/ decoded in a first stage even without applying the initialization of a predicter synchronizing with each predictive coding device in the case that the predictive coding device and a predictive decoding device are connected in multiple stages. CONSTITUTION: In this predictive coding device 1 containing a predictive error signal quantization means 12 which generates the quantize output signal of an integer value by quantizing the predictive error signal of the integer value, the predictive error signal quantization means 12 is provided with a quantize characteristic to output the predictive error signal as the quantize output signal as it is in a range in which the amplitude of the predictive error signal is small and also, to output a value as it is with respect to the predictive error signal of a value equal to the quantize output signal.



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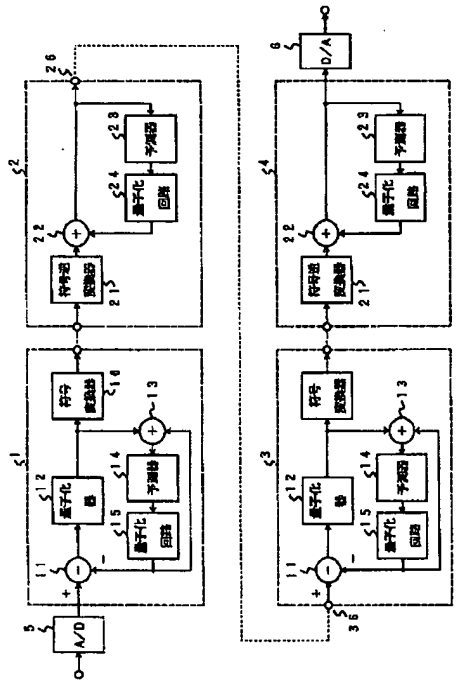
(54)【発明の名称】　予測符号化装置及び予測複号化装置

(57)【要約】

【目的】　予測符号化装置と予測複号化装置とを多段に接続した場合に、各々の予測符号化装置で同期して予測器の初期値化の処理を行わなくても、１段目で予測符号化復号化された画像信号に対して、２段目以降で予測符号化復号化を繰り返した時に予測符号化による量子化雑音が累積して行かない様に出来る予測符号化装置を提供すること。

【構成】　整数値の予測誤差信号を量子化して整数値の量子化出力信号を生成する予測誤差信号量子化手段１２を含む予測符号化装置１において、前記予測誤差信号量子化手段が、前記予測誤差信号の振幅が小さい範囲では該予測誤差信号をそのまま前記量子化出力信号として出力し、且つ前記量子化出力信号と等しい値の前記予測誤差信号に対してはそのままの値を出力する量子化特性を有しているものであることを特徴とする予測符号化装置。



【特許請求の範囲】

【請求項1】　画像信号を符号化するのに予測符号化装置と予測復号化装置を用いてディジタルベースで多段に接続して符号化復号化を繰り返す装置において、前段の予測符号化で用いた予測関数と同じ特性に従って局部復号信号から予測信号を得、予測関数の係数が小数点以下の値を有し予測信号が小数点以下の値を有する場合は予測信号の小数点以下の値を量子化して整数値として予測信号を出力する手段と、入力画像信号から前記予測信号を減算して予測誤差信号を得る手段と、前記予測符号化で用いた量子化特性の量子化出力レベルと等しい値の量子化入力信号に対してはそのままの値を出力し、水平同期区間の平坦部においては局部復号信号が入力信号に等しくなるようにするため予測誤差信号の振幅が小さい範囲では入力信号と同じ精度の信号を出力する量子化特性を有し前記予測誤差信号を量子化して整数の量子化出力信号を出力する量子化手段と、前記量子化出力信号を符号化して送り出す手段と、前記量子化出力信号と前記予測信号とから整数の前記局部復号信号を得る手段を備え、ディジタルベースで予測符号化復号化を多段に繰り返して行う過程で、2段目以降では予測符号化による量子化歪みが何も累積しないようにしたことを特徴とする予測符号化装置。

【請求項2】　整数値の予測誤差信号を量子化して整数値の量子化出力信号を生成する予測誤差信号量子化手段を含む予測符号化装置において、前記予測誤差信号量子化手段が、前記予測誤差信号の振幅が小さい範囲では該予測誤差信号をそのまま前記量子化出力信号として出力し、且つ前記量子化出力信号と等しい値の前記予測誤差信号に対してはそのままの値を出力する量子化特性を有しているものであることを特徴とする予測符号化装置。

【請求項3】　入力画像信号から整数値の予測信号を減算して整数値の予測誤差信号を生成する減算手段と、該減算手段により生成され前記整数値の予測誤差信号を量子化して整数値の量子化出力信号を生成する予測誤差信号量子化手段と、該予測誤差信号量子化手段により生成された前記整数値の量子化出力信号と前記整数値の予測信号とを加算して整数値の局部複号信号を生成する加算手段と、該加算手段により生成された前記整数値の局部複号信号から所定の予測関数に従って少数点以下の値を有する予測信号を生成する予測手段と、該予測手段により生成された前記少数点以下の値を有する予測信号を量子化して前記整数値の予測信号を生成し、該整数値の予測信号を前記減算手段及び前記加算手段に供給する予測信号量子化手段と、前記量子化出力信号を伝送符号に変換して送り出す符号変換手段とを有し、前記予測誤差信号量子化手段は、前記予測誤差信号の振幅が小さい範囲では該予測誤差信号をそのまま前記量子化出力信号として出力し、且つ前記量子化出力信号と等しい値の前記予測誤差信号に対してはそのままの値を出力する量子化特性を有しているものであることを特徴とする予測符号化装置。

【請求項4】　請求項3記載の予測符号化装置から送られてきた前記伝送符号を量子化出力信号に再生する符号逆変換手段と、該符号逆変換手段により得られた前記量子化出力信号と整数の予測信号とを加算して複号信号を生成する加算手段と、請求項1記載の予測符号化装置に設けられた前記予測手段が持つ前記予測関数と同じ予測関数に従って前記加算手段により生成された前記複号信号から少数点以下の値を有する予測信号を生成する予測手段と、該予測手段により生成された前記少数点以下の値を有する予測信号を量子化して前記整数値の予測信号を生成し、該整数値の予測信号を前記加算手段に供給する予測信号量子化手段とを有することを特徴とする予測複号化装置。

【請求項5】　請求項3記載の予測符号化装置と、請求項4記載の予測複号化装置とを多段に有することを特徴とするテレビ信号の符号化複号化システム。

【発明の詳細な説明】

【0001】

【産業上の利用分野】本発明は、テレビ信号を予測符号化して伝送するのに符号化復号化を多段に繰り返して行うシステムの予測符号化装置及び予測複合化装置に関し、特にディジタルベースで多段に接続して符号化復号化を繰り返しても予測符号化による量子化雑音が2段目以降で何も累積しない様にした予測符号化装置及び予測複合化装置に関する。

【0002】

【従来の技術】テレビ信号を予測符号化して得られる符号化圧縮データの信号をディジタルＶＴＲ（ビデオ　テープ　レコーダー）に一旦記録し、その後ＶＴＲから記録された圧縮データ信号を読みだして復号化し、復号信号を編集して再び予測符号化してＶＴＲに記録する場合、予測符号化復号化がディジタルベースで多段に繰り返されることになり、予測符号化における量子化雑音がＶＴＲでダビングを繰り返すたびに増加するという欠点が有った。

【0003】また、これを改善する方法として多段に接続しても2段目以降では予測符号化による量子化雑音が累積しない方法として、特開昭５８－１１４６８３号公報に示される予測符号化装置がある。

【0004】この従来例では、すべての予測器を同期して初期化する必要が有った。

【0005】従来例の構成を、図面を用いて説明する。図5に従来例のブロック構成を、図6に量子化器２１１の量子化特性を、図7に予測器２１３の具体的構成例を示す。

【0006】Ａ／Ｄ変換器２０５で複合カラーテレビ信号はカラーサブキャリアの3倍の周波数で標本化され、予測符号化装置２０１の減算器２１０で予測誤差信号ｅ

が求められ、量子化器２１１で図6の量子化特性にしたがって量子化され、符号変換器２１６および加算器２１２へ送られる。加算器２１２で局部復号信号が求められると、予測器２１３で予測関数にしたがって次の標本化時刻の予測値を求める。予測効率の良い予測関数Ｐとして次のＺ関数、$P=0.5Z^{-1}+Z^{-3}-0.5Z^{-4}$、で示されるものがある。この予測関数を持つ予測器２１３の具体的構成例を図7に示す。

【０００７】多段接続したときに予測器の初期値の同期化を行うため予測器のレジスタ２３２～２３５の初期値化を行う。水平同期信号Ｈが入力されるたびに、レジスタのＢの入力端子に初期値としてあらかじめ定められた値のＸａ或いはＸｂの信号が取り込まれる。

【０００８】符号変換器２１６では量子化出力を伝送符号に変換して出力し、予測復号化装置２０２へ送る。符号逆変換器２１７は伝送符号から量子化出力信号を再生し、加算器２１４で復号信号を求め、次の段の予測符号化装置２０３へ送ると共に、予測器２１５へ送られ、次の予測信号が求められる。予測器２１５は予測器２１３と同じ構成で、水平同期信号の始め毎に初期化が行われる。予測符号化装置２０３は予測符号化装置２０１と、予測復号化装置２０４は予測復号化装置２０２とそれぞれ同じ構成であり、同じ動作を行い、水平同期信号の始め毎に予測器の初期化が行われる。

【０００９】これにより、予測符号化装置２０３では予測符号化装置２０１で行われたとまったく同じ動作で符号化処理を行い、量子化器２２１から出力される信号は量子化器２１１から出力される量子化出力信号に一致し、加算器２２２から出力される局部復号信号は加算器２１２から出力される局部復号信号と一致し、これは入力信号に一致する。同様に予測復号化装置２０４は予測復号化装置２０２で行われたとなったく同じ動作を繰り返して復号化処理を行い、加算器２２４から出力される復号信号は加算器２２２から出力される局部復号信号に一致する。

【００１０】すなわち１段目の復号信号は、言い替えると２段目の入力信号は、２段目の復号信号と一致する。すなわち多段に接続しても２段目以降では予測符号化による量子化雑音が何も累積しない。

【００１１】

【発明が解決しようとする課題】上述した従来例では、この方法は、あらかじめ定められた周期でそれぞれの装置の予測器の初期値化が必要であり、この初期値化の手段は、予測符号化装置と予測復号化装置を繰り返して多段に接続するシステムを構成する上で制限事項となり、また初期値化の手段が必要で有るという欠点があった。

【００１２】本発明は、従来の予測器符号化装置の欠点をなくす予測符号化装置を提供するものである。すなわち、本発明の目的は、多段に接続された場合に、各々の予測符号化装置で同期して予測器の初期値化の処理を行わなくても、１段目で予測符号化復号化された画像信号に対して、２段目以降で予測符号化復号化を繰り返した時に予測符号化による量子化雑音が何も累積して行かない様に出来る予測符号化装置を提供する事にある。

【００１３】

【課題を解決するための手段】請求項１記載の発明によれば、画像信号を符号化するのに予測符号化装置と予測復号化装置を用いてディジタルベースで多段に接続して符号化復号化を繰り返す装置において、前段の予測符号化で用いた予測関数と同じ特性に従って局部復号信号から予測信号を得、予測関数の係数が小数点以下の値を有し予測信号が小数点以下の値を有する場合は予測信号の小数点以下の値を量子化して整数値として予測信号を出力する手段と、入力画像信号から前記予測信号を減算して予測誤差信号を得る手段と、前記予測符号化で用いた量子化特性の量子化出力レベルと等しい値の量子化入力信号に対してはそのままの値を出力し、水平同期区間の平坦部においては局部復号信号が入力信号に等しくなるようにするため予測誤差信号の振幅が小さい範囲では入力信号と同じ精度の信号を出力する量子化特性を有し前記予測誤差信号を量子化して整数の量子化出力信号を出力する量子化手段と、前記量子化出力信号を符号化して送り出す手段と、前記量子化出力信号と前記予測信号とから整数の前記局部復号信号を得る手段を備え、ディジタルベースで予測符号化復号化を多段に繰り返して行う過程で、２段目以降では予測符号化による量子化歪みが何も累積しないようにしたことを特徴とする予測符号化装置が得られる。

【００１４】請求項２記載の発明によれば、整数値の予測誤差信号を量子化して整数値の量子化出力信号を生成する予測誤差信号量子化手段を含む予測符号化装置において、前記予測誤差信号量子化手段が、前記予測誤差信号の振幅が小さい範囲では該予測誤差信号をそのまま前記量子化出力信号として出力し、且つ前記量子化出力信号と等しい値の前記予測誤差信号に対してはそのままの値を出力する量子化特性を有しているものであることを特徴とする予測符号化装置が得られる。

【００１５】請求項３記載の発明によれば、入力画像信号から整数値の予測信号を減算して整数値の予測誤差信号を生成する減算手段と、該減算手段により生成され前記整数値の予測誤差信号を量子化して整数値の量子化出力信号を生成する予測誤差信号量子化手段と、該予測誤差信号量子化手段により生成された前記整数値の量子化出力信号と前記整数値の予測信号とを加算して整数値の局部複号信号を生成する加算手段と、該加算手段により生成された前記整数値の局部複号信号から所定の予測関数に従って少数点以下の値を有する予測信号を生成する予測手段と、該予測手段により生成された前記少数点以下の値を有する予測信号を量子化して前記整数値の予測信号を生成し、該整数値の予測信号を前記減算手段及び

前記加算手段に供給する予測信号量子化手段と、前記量子化出力信号を伝送符号に変換して送り出す符号変換手段とを有し、前記予測誤差信号量子化手段は、前記予測誤差信号の振幅が小さい範囲では該予測誤差信号をそのまま前記量子化出力信号として出力し、且つ前記量子化出力信号と等しい値の前記予測誤差信号に対してはそのままの値を出力する量子化特性を有しているものであることを特徴とする予測符号化装置が得られる。

【００１６】請求項４記載の発明によれば、請求項３記載の予測符号化装置から送られてきた前記伝送符号を量子化出力信号に再生する符号逆変換手段と、該符号逆変換手段により得られた前記量子化出力信号と整数の予測信号とを加算して複号信号を生成する加算手段と、請求項１記載の予測符号化装置に設けられた前記予測手段が持つ前記予測関数と同じ予測関数に従って前記加算手段により生成された前記複号信号から少数点以下の値を有する予測信号を生成する予測手段と、該予測手段により生成された前記少数点以下の値を有する予測信号を量子化して前記整数値の予測信号を生成し、該整数値の予測信号を前記加算手段に供給する予測信号量子化手段とを有することを特徴とする予測複号化装置が得られる。

【００１７】請求項５記載の発明によれば、請求項３記載の予測符号化装置と、請求項４記載の予測複号化装置とを多段に有することを特徴とするテレビ信号の符号化複号化システムが得られる。

【００１８】

【実施例】次に本発明について図面を参照して説明する。

【００１９】図１に本発明の一実施例のブロック構成を示す。

【００２０】Ａ／Ｄ変換器５に入力されたＮＴＳＣ複合カラーテレビ信号は、カラーサブキャリアｆscの３倍の周波数（３・ｆsc）で８ビットのＰＣＭ信号（－１２８～１２７の値）に標本化され、予測符号化装置１の減算器（減算手段）１１に送られ、予測信号との差分が行われて予測誤差信号Ｅを求め、量子化器（予測誤差信号量子化手段）１２に送られ、あらかじめ定められた量子化特性にしたがって予測誤差信号Ｅを量子化して量子化出力信号Ｑを出力し、符号変換器１６および加算器（加算手段）１３へ供給する。

【００２１】量子化１２は図２に示す量子化特性を有し、小振幅の予測誤差信号は入力信号と同じ精度でそのまま出力し、かつ、整数値の量子化出力信号と同じ値が予測誤差信号として入力されると同じ値をそのまま量子化出力信号として出力する特性を有する。

【００２２】加算器１３では量子化出力信号と予測信号とが加算され、局部復号信号が求められ、予測器（予測手段）１４へ供給され、予測関数にしたがって次の標本化時刻の予測値を求める。

【００２３】標本化周波数が３・ｆscの時、複合カラーテレビ信号を直接予測符号化する場合に、予測効率の良い予測関数Ｐとして次のＺ関数、$P=0.5Z^{-1}+Z^{-3}-0.5Z^{-4}$、で与えられるものがある。この予測関数の係数は小数点以下の値を持ち、したがって求められた予測値は小数点以下の値を持つ事になる。小数点以下の演算は、係数の精度にもよるが、例えば小数点以下４ビットの精度で計算する。

【００２４】入力のＰＣＭ信号は８ビットで示される整数値を有するため、局部復号信号も整数値となるようにする。このため量子化回路（予測信号量子化手段）１５は予測器１４からの予測値を四捨五入等により小数点以下を量子化して整数の予測値とし、次の予測信号として出力して、減算器１１および加算器１３へ供給する。加算器１３では量子化出力信号Ｑおよび予測信号が整数値であるので局部復号信号も整数値となる。

【００２５】テレビ信号の水平同期区間のバックポーチは輝度信号のレベルがほぼ一定でＰＣＭ信号値もほぼ一定の値となる。この部分では予測器で予測される予測信号は入力ＰＣＭ信号と良く一致し、したがって両者の差分の予測誤差信号は０または振幅の小さい整数値となる。量子化器１２の量子化特性が小振幅の予測誤差信号はそのまま出力する特性に定められているため、予測信号と量子化出力信号を加算して得られる局部復号信号は、予測誤差信号が小さい範囲では、入力ＰＣＭ信号に一致する。

【００２６】すなわち、局部復号信号を、したがって復号信号を、入力信号に一致させる事が出来るということは、予測器のレジスタの値を決められた値に設定でき、したがってそれ以降の予測値は各予測器で一致させることができ、それによって初期化が行えることになる。

【００２７】なお、多段接続の為に必要な初期化の方法の説明は特開昭５８－１１４６８３号公報に詳しく示される。

【００２８】符号変換器（符号変換手段）１６では量子化出力信号を伝送符号に変換し、復号化に必要な信号をつけ加えて出力し、予測復号化装置２へ供給する。以上が、予測符号化装置１の動作である。

【００２９】予測復号化装置２の動作は次の通りである。符号変換器１６から送られてきた信号は符号逆変換器（符号逆変換手段）２１で符号変換器１６の逆の処理が行われ、伝送符号から量子化出力信号を再生し、加算器（加算手段）２２に供給する。加算器２２は予測信号と量子化出力信号を加算して復号信号を求め出力端子２６へ出力すると共に予測器（予測手段）２３へ供給する。

【００３０】予測器２３は予測器１４と、量子化回路（予測信号量子化手段）２４は量子化回路１５と、各々同じ構成で同じ機能を有し、復号信号から予測関数にしたがって次の予測値を求め量子化回路２４に送り、整数に量子化した予測信号を出力し、加算器２２に供給す

る。

【００３１】伝送路エラー等がなければ復号信号は予測符号化装置１の局部復号信号と一致する。

【００３２】すなわち、水平同期区間等や画像の変化の少ない平坦部では、予測器の予測信号がうまく当たるため、予測誤差信号は小振幅となり、図２の量子化特性によれば小振幅では量子化雑音は発生しないので、予測符号化復号化されて再生された復号信号は入力ＰＣＭ信号と一致する。言い替えると情報保存して符号化される。

【００３３】伝送路エラーが有っても正しく復号化するためには、エラーの伝搬を止める必要がある。１つの方法は、エラーがしだいにリークして０となるようにするため予測器の利得を１より小さい値にしてリーク積分を行う。すなわち予測器の直流成分の利得を１より小さくすればよい。このためには例えば予測関数として前述のものでなく変わりに、リーク係数ｋとしてｋ＝（１－2^{-4}）を掛け、Ｐ＝（１－2^{-4}）（０．５Z^{-1}＋Z^{-3}－０．５Z^{-4}）の関数を用いれば、伝送路エラーが有っても復号信号に含まれるエラー信号は次第にリークされて０となり正しい復号信号が得られ、送受で復号信号が一致する。

【００３４】もう１つの方法は、適当な周期で送信側と受信側の予測器のレジスタの値を決められた初期値となるようにリセットして、次の予測信号が送受で一致するようにする。伝送路のエラーの発生頻度に応じて、フレームに１回とか数十ラインに１回とか行う。エラー伝送阻止のためのリセットは予測符号化復号化の各段で独立に行えば良く、一致して行う必要はない。伝送路のエラーレートが各段で異なる時は、１段目と２段目で異なる周期でリセットを行ってもかまわない。

【００３５】１段目の予測符号化装置１および予測符号化装置２で符号化復号化されて得られた復号信号は、２段目の予測符号化装置３および予測復号化装置４に供給され、符号化復号化が行われる。

【００３６】予測符号化装置３および予測復号化装置４は１段目の予測符号化装置１および予測復号化装置２と同じ構成で同じ動作を行う。すなわち予測符号化装置３の減算器１１、量子化器１２、加算器１３、予測器１４、量子化回路１５、符号変換器１６は、１段目の予測符号化装置１の各部と同じ構成で同じ動作をする。同様に、予測復号化装置４の符号逆変換器２１、加算器２２、予測器２３、量子化回路２４は、予測復号化装置１の各部と同じ構成で同じ動作をする。

【００３７】水平同期信号の区間等の平坦部で信号変化の少ない所は情報保存して符号化されるため、平坦部においては、１段目の予測符号化装置１へ入力されたＰＣＭ信号と同じ値の信号が予測復号化装置の出力に得られ、再び２段目の予測符号化装置３の入力ＰＣＭ信号として入力される。

【００３８】すなわち平坦部において、入力信号が一致する事より、予測器１４の内部レジスタの値が１段目と２段目で一致し、その後は、１段目と２段目は同じ予測信号を出力する。また２段目の入力信号と１段目の局部復号信号が等しいことにより、２段目の減算器１１から出力される予測誤差信号は、１段目の量子化出力信号と一致した値となる。

【００３９】予測誤差信号は量子化器１２に供給され、図２に示す量子化特性で量子化されるが、量子化出力信号の値を持つ入力信号はそのまま出力される特性であり、１段目の量子化出力信号と一致した値の量子化出力信号が出力され、加算器１３に供給される。

【００４０】加算器１３に入力される予測信号と量子化出力信号が１段目と２段目で一致する事により、加算器１３から出力される局部復号信号も１段目と２段目が一致した値となる。

【００４１】すなわち、１段目では、量子化雑音が生じたが、２段目では量子化雑音は発生せず、２段目の予測符号化装置３においては局部復号信号と入力信号は一致し、予測復号化装置４は予測復号化装置２とまったく同様の動作を行い、予測符号化装置３の局部復号信号と同じ値の信号を復号する。

【００４２】したがって、２段目以降は、何段接続しても、２段目と動作となり、入力信号と同じ信号を復号信号として得る事が出来る。すなわち多段に接続しても、２段目以降では量子化雑音は累積しない事になる。

【００４３】量子化器１２の量子化特性として他の例を示す。

【００４４】４ビットの量子化器ＡおよびＢを画像信号の領域によって切り換える構成である。

【００４５】量子化特性Ａの圧伸則は正負対称のＭＴ（ミッドトレッド）型で、ステップ幅は０，１，１，１，３，７，１５，３１で、最大量子化ステップは５９、量子化レベル数は１５の特性を有する。これは平坦部に適した量子化特性で、情報保存の符号化が行えるように、小振幅の予測誤差（－３～３）に対してはそのまま量子化出力信号として出力される特性である。

【００４６】量子化特性Ｂの圧伸則は正負対称のＭＴ型で、ステップ幅０，１，３，７，１５，２９，２９，２９で、最大量子化ステップは１１１３、量子化レベル数は１５の特性を有する。画像が大きく変化する領域に適した特性で、過渡応答特性が良くなるようダイナミックレンジを広く取って有る。

【００４７】なお、量子化特性の入力側の各閾値は量子化出力特性の前後の量子化レベルの中点に取る。量子化特性Ａおよび量子化特性Ｂの変換特性は、正負対称で正側のみ示すと次のようになる。伝送符号は量子化出力を４ビットの符号に変換する。Ｓは符号を示し正の時０、負の時１である。

【００４８】

量子化特性Ａ			量子化特性Ｂ		
予測誤差	量子化出力	伝送符号	予測誤差	量子化出力	伝送符号
0	0	0001	0	0	0001
1	1	001S	1～ 2	1	001S
2	2	010S	3～ 7	4	010S
3～ 4	3	011S	8～18	11	011S
5～ 9	6	100S	19～40	26	100S
10～20	13	101S	41～69	55	101S
21～43	28	110S	70～98	84	110S
44～	59	111S	99～	113	111S

１水平走査の中で水平同期区間と画像区間とに分けて量子化特性を切り換える。水平同期区間では、量子化特性Ａで量子化を用い、水平同期区間の平坦部で予測器の初期化が行える様にし、画像区間では量子化特性Ｂを用いて過渡応答が良い量子化を行う。

【００４９】図４に量子化特性を切り換える場合の本発明の予測符号化装置７０と予測復号化装置８０の構成例を示す。

【００５０】予測符号化装置７０は予測符号化装置１と同様に構成される。同期分離回路７１は、アナログ画像信号あるいはディジタル画像信号から同期分離を行い水平同期信号をもとめ、制御回路７２で切り換えの制御信号を発生し、量子化器７６の切り換え器７５を制御する。量子化器Ａは量子化特性Ａを、量子化器Ｂは量子化特性Ｂを有する。符号変換器７７は量子化出力を伝送符号に変換するとともに、切り換えのタイミングが分かる様に同期情報を付加して出力する。

【００５１】予測復号化装置８０は予測復号化装置２と同様に構成される。符号逆変換器７８は同期情報を分離し制御回路で切り換えのタイミングの制御信号を発生し、符号逆変換器では切り換え信号にしたがって伝送符号から、量子化特性Ａまたは量子化特性Ｂの量子化出力を出力する。

【００５２】２段目以降では、同期分離回路７１はディジタル画像信号から同期分離をする他に、１段目の制御回路７９から同期信号の情報を得る構成も可能である。

【００５３】この切り換えの構成は、量子化ビット数が少なくて、水平同期区間で小振幅の予測誤差信号となる信号に対する情報保存の為の量子化と、画像区間でダイナミックレンジの広い量子化を行う両方を満足させる量子化特性として有効である。

【００５４】予測関数は標本化周波数によっても変わり、またフィールドやフレームの相関を用いるとさらに効率の良い予測が行える。

【００５５】量子化回路１５は予測信号に０．５を加算して小数点以下を切り捨てる構成によれば四捨五入が行える。しかしこの構成では加算器が必要となるので、予測器の加算器を共用する方法として、予測器１４へ入力される整数値の局部復号信号に直流成分信号として０．５を加算して置けば（小数点の下に１ビットつけ加えハイレベル信号とする）、予測器１４から得られた予測信号を量子化回路１５で小数点以下を単に切り捨てる事によって、等価的に四捨五入が行える。

【００５６】符号変換器では等長符号化の変わりに可変長符号化を用いればさらに符号化効率が上がる。

【００５７】多段接続の構成は、ディジタルＶＴＲに符号化データを書き込む場合の他、放送信号をデータ圧縮してディジタル伝送するのに、途中の中継局で画像信号のチェックや編集作業を伴って中継してディジタル伝送する場合、予測符号化復号化の多段の構成となり本発明の方式は有効となる。

【００５８】

【発明の効果】本発明は、予測符号化装置及び予測復号化装置を多段に接続した場合に、従来例のように各々の予測符号化装置および予測復号化装置で同期化して各予測器を初期値化する必要があったが、本発明では、水平同期信号等の平坦部で入力信号と同じ信号が（局部）復号信号に得る事が出来るようにし、等価的に初期化行う事により、１段目で予測符号化復号化された画像信号に対して、２段目以降で予測符号化復号化を繰り返しても２段目以降では量子化雑音が何も累積しない様に出来る予測符号化装置を提供できる。

【図面の簡単な説明】

【図１】本発明の一実施例の構成を示すブロック図。

【図２】図１の実施例の量子化器１２の具体的特性を示す図。

【図３】図１の実施例の予測器１４の具体的構成例を示す図。

【図４】本発明の他の実施例の予測符号化装置の構成を示すブロック図。

【図５】従来の実施例の構成を示すブロック図。

【図６】図５の従来の実施例の量子化器２１１の具体的特性例を示す図。

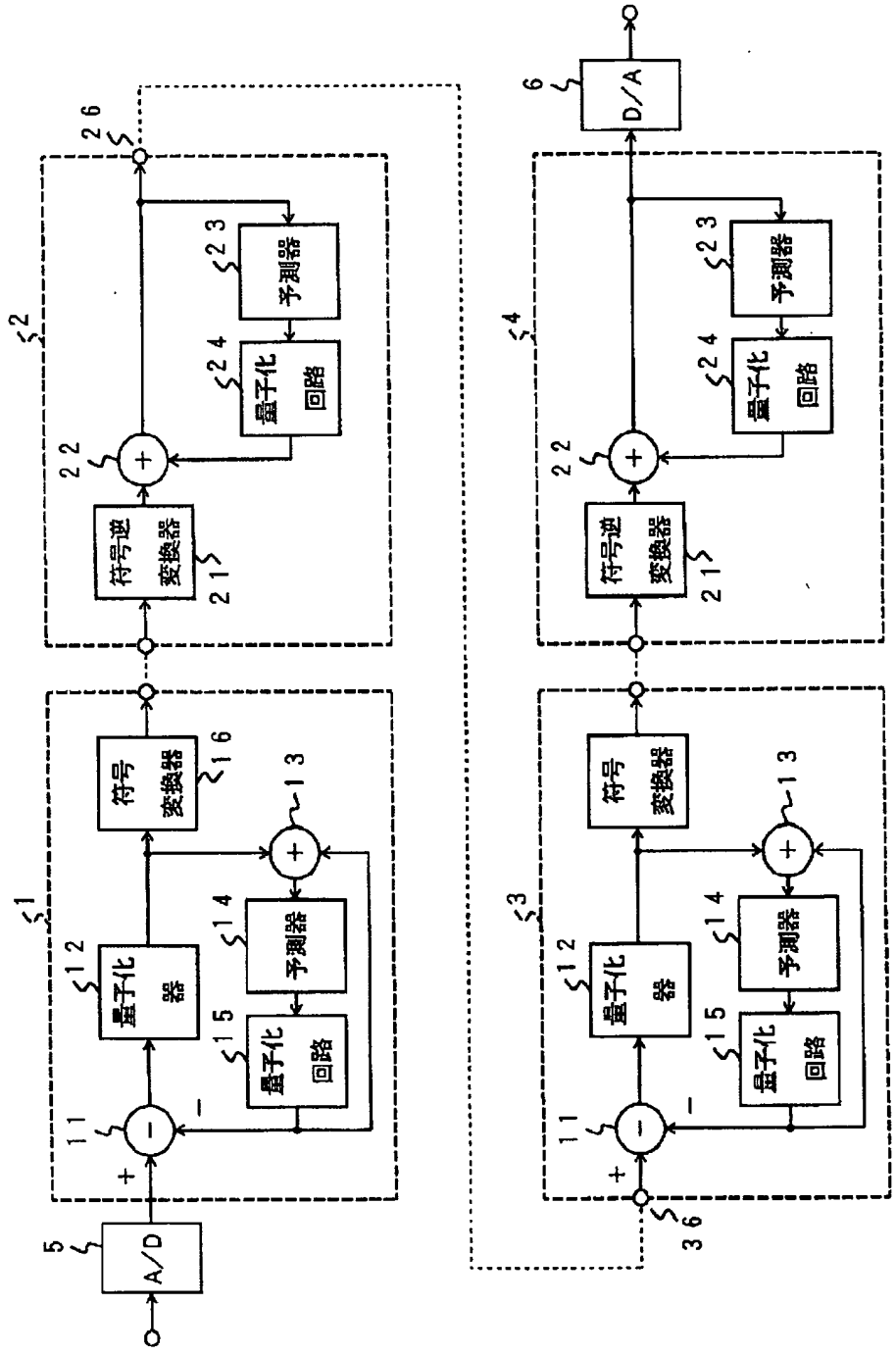
【図７】図５の従来の実施例の予測器２１３の具体的構成例を示す図。

【符号の説明】

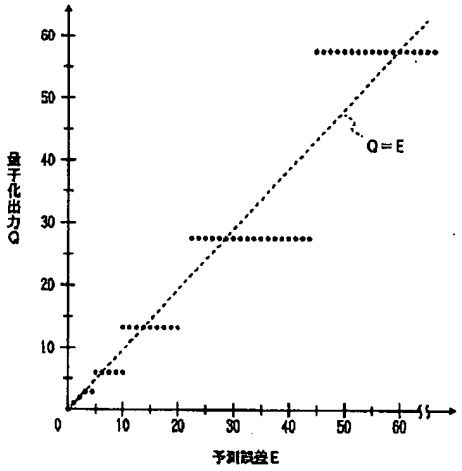
１，３，７０　予測符号化装置
２，４，８０　予測復号化装置
１１，　減算器
１２，７６　量子化器

13，22	加算器	16，77	符号変換器
14，23	予測器	21，78	符号逆変換器
15，24	量子化回路		

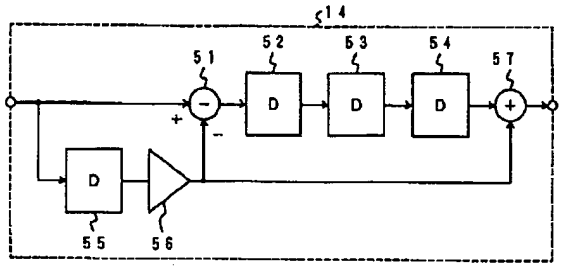
【図1】



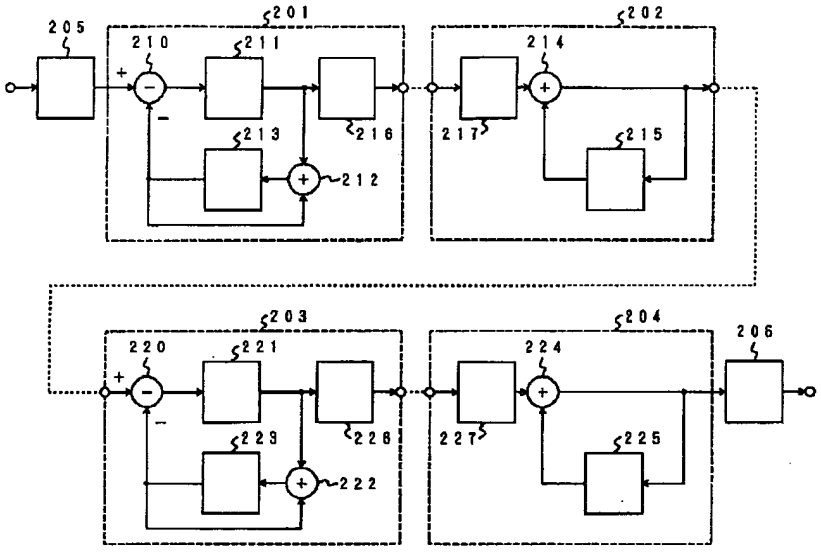
【図2】


Q=E
予測誤差E

【図3】


14
51
52
53
54
57
D
55
56

【図5】


201
202
203
204
205
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211
212
213
214
215
216
217
220
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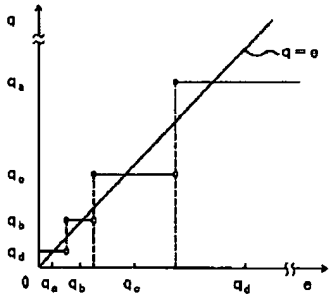
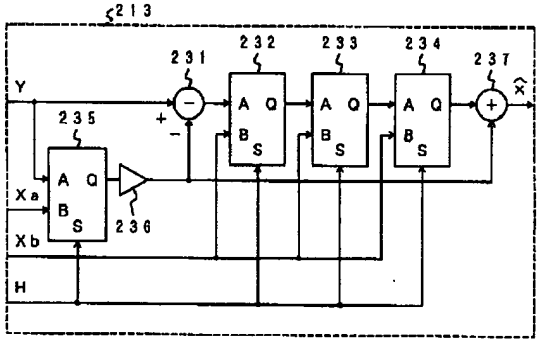
224
225
226
227

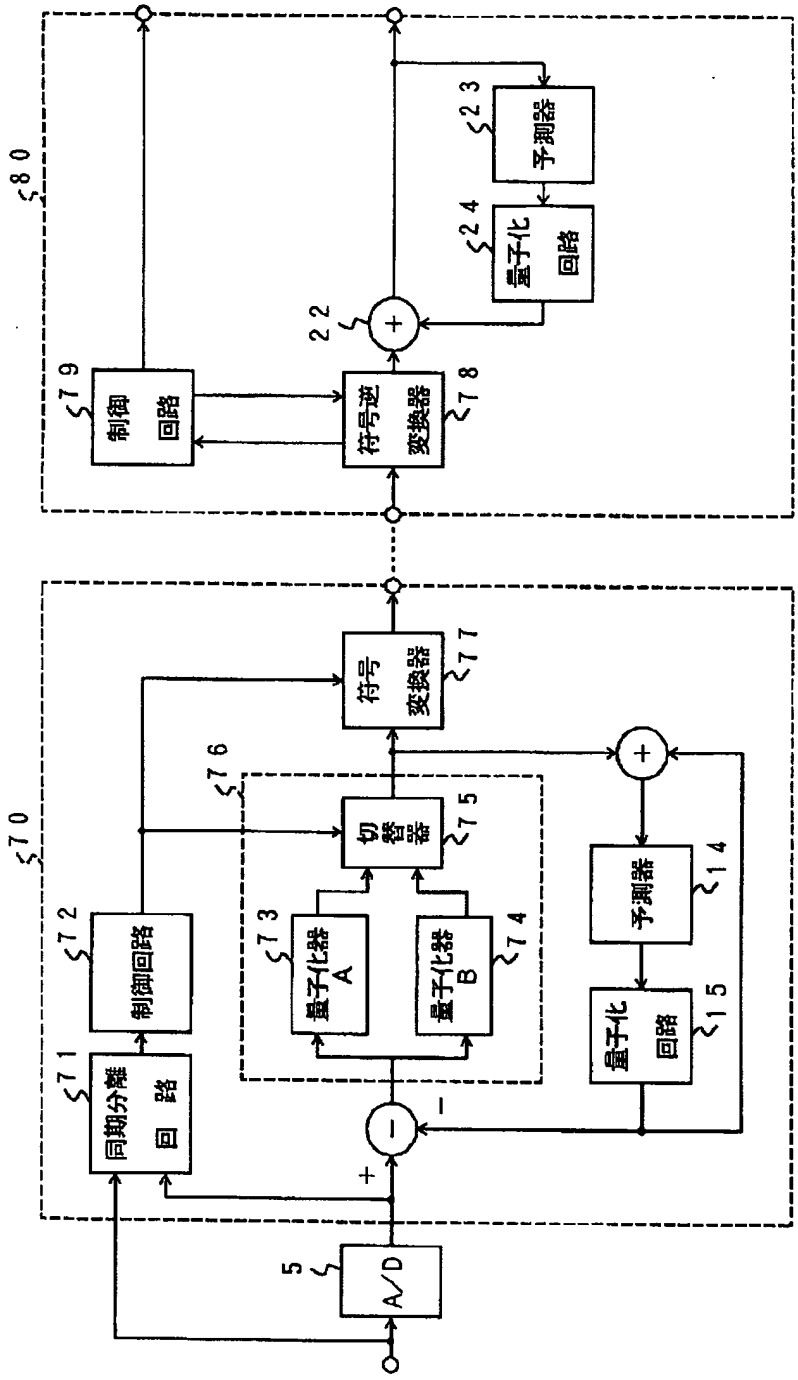
【図6】


q=e
q
qa
qo
qb
qd
0
e

【図7】


213
231
232
233
234
235
236
237
Y
Xa
Xb
H
A Q
B S

【図4】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(57) **Abstract**
Objects of the Invention Even if it does not process initialization of a prediction device with each prediction-coding device synchronizing with the case where a prediction-coding device and a prediction double sign-ized device are connected to multistage, To the picture signal by which prediction-coding decryption was carried out in the 1st step, when you repeat prediction-coding decryption henceforth **the 2nd step** , provide the prediction-coding device the quantization noise by prediction coding can be prevented from accumulating.
Elements of the Invention In the prediction-coding device 1 including the prediction error signal quantization means 12 which quantizes a prediction error signal of an integral value and generates a quantization output signal of an integral value, Said prediction error signal quantization means outputs this prediction error signal as said quantization output signal as it is in the range with small amplitude of said prediction error signal, And a prediction-coding device being what has the quantization characteristic which outputs a value as it is to said prediction error signal of a value equal to said quantization output signal.

Claim(s)
Claim 1 In a device which uses a prediction-coding device and a prediction decoding device for

coding a picture signal, connects with multistage on a digital basis, and repeats coding decryption, According to the same characteristic as a prediction function used by prediction coding of the preceding paragraph, a prediction signal is acquired from a local decoded signal, A means to quantize a value below a decimal point of a prediction signal, and to output a prediction signal as an integral value when a coefficient of a prediction function has a value below a decimal point and a prediction signal has a value below a decimal point, A means to subtract said prediction signal from an input picture signal, and to acquire a prediction error signal, A value as it is is outputted to a quantization input signal of a value equal to a quantization output level of the quantization characteristic used by said prediction coding, A quantization means to which amplitude of a prediction error signal has the quantization characteristic which outputs a signal of the same accuracy as an input signal in the small range, quantizes said prediction error signal, and outputs an integral quantization output signal in order to make it a local decoded signal become equal to an input signal in a flat part of the horizontal synchronization section, In a process in which have a means to code and send out said quantization output signal, and a means to acquire said integral local decoded signal from said quantization output signal and said prediction signal, and repeat prediction-coding decryption to multistage and it is performed on a digital basis. A prediction-coding device characterized by making it quantization distortion by prediction coding accumulate nothing henceforth **the 2nd step** .

Claim 2 In a prediction-coding device including a prediction error signal quantization means which quantizes a prediction error signal of an integral value and generates a quantization output signal of an integral value, Said prediction error signal quantization means outputs this prediction error signal as said quantization output signal as it is in the range with small amplitude of said prediction error signal, And a prediction-coding device being what has the quantization characteristic which outputs a value as it is to said prediction error signal of a value equal to said quantization output signal.

Claim 3A prediction means which generates a prediction signal, comprising, A prediction signal quantization means which quantizes a prediction signal which has a value below said a small number of point generated by this prediction means, generates a prediction signal of said integral value, and supplies a prediction signal of this integral value to said subtraction means and said adding means, Have a code translation means to change said quantization output signal into a modulation code, and to send it out, and said prediction error signal quantization means, A prediction-coding device being what has the quantization characteristic which outputs this prediction error signal as said quantization output signal as it is in the range with small amplitude of said prediction error signal, and outputs a value as it is to said prediction error signal of a value equal to said quantization output signal.

A subtraction means which subtracts a prediction signal of an integral value from an input picture signal, and generates a prediction error signal of an integral value.

A prediction error signal quantization means which is generated by this subtraction means, quantizes a prediction error signal of said integral value, and generates a quantization output signal of an integral value.

An adding means which adds a quantization output signal of said integral value generated by this prediction error signal quantization means, and a prediction signal of said integral value, and generates a local double sign signal of an integral value.

A predetermined prediction function is followed from a local double sign signal of said integral value generated by this adding means, and it is a value below a a small number of point.

Claim 4A prediction double sign-ized device characterized by comprising the following.

A numerals inverse transformation means to reproduce said modulation code sent from the prediction-coding device according to claim 3 to a quantization output signal.

An adding means which adds said quantization output signal acquired by this numerals inverse transformation means, and an integral prediction signal, and generates a double sign signal.

A prediction means which generates a prediction signal which has a value below a a small number of point from said double sign signal generated by said adding means according to the same prediction function as said prediction function which said prediction means provided in the prediction-coding device according to claim 1 has.

A prediction signal quantization means which quantizes a prediction signal which has a value below

said a small number of point generated by this prediction means, generates a prediction signal of said integral value, and supplies a prediction signal of this integral value to said adding means.

Claim 5A coding double sign-ized system of a TV signal having the prediction-coding device according to claim 3 and the prediction double sign-ized device according to claim 4 in multistage.

Detailed Description of the Invention

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Industrial Application This invention about the prediction-coding device of a system and prediction composite-ized device which repeat coding decryption to multistage and carry it out to carrying out prediction coding of the TV signal, and transmitting it, It is related with the prediction-coding device and prediction composite-ized device which were carried out as **accumulate / henceforth / the 2nd step / the quantization noise by prediction coding / even if it connects with multistage especially on a digital basis and repeats coding decryption / nothing** .

0002

Description of the Prior Art The signal of the coding compression data produced by carrying out prediction coding of the TV signal is once recorded on a digital video tape recorder (video tape recorder), The compressed data signal recorded from VTR after that is read and decrypted, When editing a decoded signal, carrying out prediction coding again and recording on VTR, there was a fault of increasing whenever prediction-coding decryption will be repeated by multistage on a digital basis and the quantization noise in prediction coding repeats dubbing with VTR.

0003 Even if it connects with multistage as a method of improving this, henceforth **the 2nd step** , methods which the quantization noise by prediction coding does not accumulate include the prediction-coding device shown in JP,S58-114683,A.

0004 In this conventional example, there was the necessity of initializing all the prediction devices synchronously.

0005 The composition of a conventional example is explained using Drawings. The quantization characteristic of the quantizer 211 is shown in drawing 6, and the example of specific constitution of the prediction device 213 is shown for the block configuration of a conventional example in drawing 5 at drawing 7.

0006A compound color television signal is sampled by a subcarrier 3 times the frequency of a color with A/D converter 205, The prediction error signal e is searched for with the subtractor 210 of the prediction-coding device 201, and it is quantized according to the quantization characteristic of drawing 6 with the quantizer 211, and is sent to the signal converter 216 and the adding machine 212. If a local decoded signal is searched for with the adding machine 212, according to a prediction function, the predicted value of the next sampling time will be calculated by the prediction device 213. there are the following Z function, $P=0.5Z^{-1}+Z^{-3}-0.5Z^{-4}$, and a thing come out of and shown as the good prediction function P of predictive efficiency. The example of specific constitution with this prediction function of the prediction device 213 is shown in drawing 7.

0007 When multi stage connection is carried out, in order to synchronize the initial value of a prediction device, initialization of the registers 232-235 of a prediction device is performed. The signal of Xa of a value or Xb beforehand provided in the input terminal of B of a register as an initial value whenever Horizontal Synchronizing signal H was inputted is incorporated.

0008 In the signal converter 216, a quantization output is changed into a modulation code, and is outputted, and it sends to the prediction decoding device 202. The numerals inverter 217 reproduces a quantization output signal from a modulation code, searches for a decoded signal with the adding machine 214, and sends it to the prediction-coding device 203 of the following stage, and it is sent to the prediction device 215 and the following prediction signal is searched for. The prediction device 215 is the same composition as the prediction device 213, and initialization is performed for every start of a Horizontal Synchronizing signal. It is the composition as the prediction decoding device 202 in which the prediction-coding device 201 and the prediction decoding device 204 of the prediction-coding device 203 are the same respectively, and the same operation is performed and initialization of a prediction device is performed for every start of a

Horizontal Synchronizing signal.

0009 This performs coding processing in the completely same operation as having been performed by the prediction-coding device 201 with the prediction-coding device 203, In accordance with the local decoded signal with which the local decoded signal outputted from the adding machine 222 is outputted from the adding machine 212 in accordance with the quantization output signal with which the signal outputted from the quantizer 221 is outputted from the quantizer 211, this is in agreement with an input signal. ** which became that the prediction decoding device 204 performed by the prediction decoding device 202 similarly -- the same operation is repeated, decoding processing is performed and the decoded signal outputted from the adding machine 224 is in agreement with the local decoded signal outputted from the adding machine 222.

0010 That is, if the 1st step of decoded signal is put in another way, the 2nd step of input signal is in agreement with the 2nd step of decoded signal. That is, even if it connects with multistage, henceforth **the 2nd step** , the quantization noise by prediction coding accumulates nothing.

0011

Problem(s) to be Solved by the Invention In the conventional example mentioned above, initialization of the prediction device of each device is **cycle defined beforehand** required for this method, and the means of this initialization, When the system which repeats a prediction-coding device and a prediction decoding device, and is connected to multistage was constituted, it became limitations, and there was a fault that the means of initialization was required and there was.

0012 This invention provides the prediction-coding device which abolishes the fault of conventional prediction device coding equipment. Namely, even if the purpose of this invention does not process initialization of a prediction device with each prediction-coding device synchronizing with the case where it is connected to multistage, To the picture signal by which prediction-coding decryption was carried out in the 1st step, when prediction-coding decryption is repeated henceforth **the 2nd step** , there is quantization noise by prediction coding in providing the prediction-coding device which nothing can accumulate.

0013

Means for Solving the Problem In a device which according to the invention according to claim 1 uses a prediction-coding device and a prediction decoding device for coding a picture signal, connects with multistage on a digital basis, and repeats coding decryption, According to the same characteristic as a prediction function used by prediction coding of the preceding paragraph, a prediction signal is acquired from a local decoded signal, A means to quantize a value below a decimal point of a prediction signal, and to output a prediction signal as an integral value when a coefficient of a prediction function has a value below a decimal point and a prediction signal has a value below a decimal point, A means to subtract said prediction signal from an input picture signal, and to acquire a prediction error signal, A value as it is is outputted to a quantization input signal of a value equal to a quantization output level of the quantization characteristic used by said prediction coding, A quantization means to which amplitude of a prediction error signal has the quantization characteristic which outputs a signal of the same accuracy as an input signal in the small range, quantizes said prediction error signal, and outputs an integral quantization output signal in order to make it a local decoded signal become equal to an input signal in a flat part of the horizontal synchronization section, In a process in which have a means to code and send out said quantization output signal, and a means to acquire said integral local decoded signal from said quantization output signal and said prediction signal, and repeat prediction-coding decryption to multistage and it is performed on a digital basis. Henceforth **the 2nd step** , a prediction-coding device characterized by making it quantization distortion by prediction coding accumulate nothing is obtained.

0014 In a prediction-coding device including a prediction error signal quantization means which according to the invention according to claim 2 quantizes a prediction error signal of an integral value and generates a quantization output signal of an integral value, Said prediction error signal quantization means outputs this prediction error signal as said quantization output signal as it is in the range with small amplitude of said prediction error signal, And to said prediction error signal of a value equal to said quantization output signal, a prediction-coding device being what has the quantization characteristic which outputs a value as it is is obtained.

0015A subtraction means which according to the invention according to claim 3 subtracts a prediction signal of an integral value from an input picture signal, and generates a prediction error

signal of an integral value, A prediction error signal quantization means which is generated by this subtraction means, quantizes a prediction error signal of said integral value, and generates a quantization output signal of an integral value, An adding means which adds a quantization output signal of said integral value generated by this prediction error signal quantization means, and a prediction signal of said integral value, and generates a local double sign signal of an integral value, A prediction means which generates a prediction signal which has a value below a a small number of point according to a predetermined prediction function from a local double sign signal of said integral value generated by this adding means, A prediction signal quantization means which quantizes a prediction signal which has a value below said a small number of point generated by this prediction means, generates a prediction signal of said integral value, and supplies a prediction signal of this integral value to said subtraction means and said adding means, Have a code translation means to change said quantization output signal into a modulation code, and to send it out, and said prediction error signal quantization means outputs this prediction error signal as said quantization output signal as it is in the range with small amplitude of said prediction error signal, And to said prediction error signal of a value equal to said quantization output signal, a prediction-coding device being what has the quantization characteristic which outputs a value as it is is obtained.

0016A numerals inverse transformation means to reproduce said modulation code sent from the prediction-coding device according to claim 3 to a quantization output signal according to the invention according to claim 4, An adding means which adds said quantization output signal acquired by this numerals inverse transformation means, and an integral prediction signal, and generates a double sign signal, A prediction means which generates a prediction signal which has a value below a a small number of point from said double sign signal generated by said adding means according to the same prediction function as said prediction function which said prediction means provided in the prediction-coding device according to claim 1 has, A prediction signal which has a value below said a small number of point generated by this prediction means is quantized, a prediction signal of said integral value is generated, and a prediction double sign-ized device having a prediction signal quantization means which supplies a prediction signal of this integral value to said adding means is obtained.

0017 According to the invention according to claim 5, a coding double sign-ized system of a TV signal having the prediction-coding device according to claim 3 and the prediction double sign-ized device according to claim 4 in multistage is obtained.

0018

ExampleNext, this invention is explained with reference to Drawings.

0019 The block configuration of one working example of this invention is shown in drawing 1.

0020 The NTSC compound color television signal inputted into A/D converter 5, It is sampled by the 8-bit PCM signal (value of -128-127) by the subcarrier fsc (3 and fsc) 3 times the frequency of a color, It is sent to the subtractor (subtraction means) 11 of the prediction-coding device 1, difference with a prediction signal is performed, and the prediction error signal E is searched for, It is sent to the quantizer (prediction error signal quantization means) 12, and the prediction error signal E is quantized according to the quantization characteristic defined beforehand, the quantization output signal Q is outputted, and the signal converter 16 and the adding machine (adding means) 13 are supplied.

0021 When the quantization 12 has the quantization characteristic shown in drawing 2, and the prediction error signal of small-size width outputs it as it is in the same accuracy as an input signal and the same value as the quantization output signal of an integral value is inputted as a prediction error signal, it has the characteristic which outputs the same value as a quantization output signal as it is.

0022 In the adding machine 13, a quantization output signal and a prediction signal are added, a local decoded signal is searched for, the prediction device (prediction means) 14 is supplied and the predicted value of the next sampling time is calculated according to a prediction function.

0023when sampling frequencies are 3 and fsc and it carries out prediction coding of the compound color television signal directly, there are the following Z function, $P=0.5Z^{-1}+Z^{-3}-0.5Z^{-4}$, and a thing come out of and given as the good prediction function P of predictive efficiency. The predicted value which the coefficient of this prediction function had a value below a decimal point, therefore was calculated will have a value below a decimal point. Although the operation below a decimal

point is based also on the accuracy of a coefficient, below a decimal point calculates it in the accuracy of 4 bits, for example.

0024 Since the PCM signal of an input has an integral value shown by 8 bits, it is made for a local decoded signal to also serve as an integral value. For this reason, below a decimal point is quantized by rounding off etc., and the predicted value from the prediction device 14 is made into an integral predicted value, is outputted as a following prediction signal, and the quantization circuit (prediction signal quantization means) 15 supplies it to the subtractor 11 and the adding machine 13. In the adding machine 13, since the quantization output signal Q and the prediction signal are integral values, a local decoded signal also serves as an integral value.

0025as for the back porch of the horizontal synchronization section of a TV signal, also in a PCM signal value, the level of a luminance signal serves as a value of about 1 law by about 1 law. In this portion, the prediction signal predicted by a prediction device is well in agreement with an input PCM signal, therefore the prediction error signal of both difference serves as 0 or an integral value with small amplitude. Since the quantization characteristic of the quantizer 12 is provided in the characteristic which the prediction error signal of small-size width outputs as it is, the local decoded signal acquired by adding a prediction signal and a quantization output signal is in agreement with an input PCM signal in the range with a small prediction error signal.

0026 That is, a local decoded signal can be followed, and it can be set as the value which was able to determine the value of the register of a prediction device that a decoded signal can be coincided with an input signal, therefore the predicted value after it can be coincided by each prediction device, and it can initialize by it.

0027 Explanation of the method of initialization required for multi stage connection is shown in JP,S58-114683,A in detail.

0028 In the signal converter (code translation means) 16, a quantization output signal is changed into a modulation code, a signal required for decryption is added and outputted, and the prediction decoding device 2 is supplied. The above is operation of the prediction-coding device 1.

0029 The operation of the prediction decoding device 2 is as follows. Reverse processing of the signal converter 16 is performed by the numerals inverter (numerals inverse transformation means) 21, and the signal sent from the signal converter 16 reproduces a quantization output signal from a modulation code, and supplies it to the adding machine (adding means) 22. The adding machine 22 adds a prediction signal and a quantization output signal, and outputs them to the output terminal 26 in quest of a decoded signal, and it is supplied to the prediction device (prediction means) 23.

0030 The prediction device 23 has the same function with the same composition respectively with the quantization circuit 15, sends it to the quantization circuit 24 in quest of the following predicted value according to a prediction function from a decoded signal, outputs the prediction signal quantized for the integer, and supplies the prediction device 14 and the quantization circuit (prediction signal quantization means) 24 to the adding machine 22.

0031 If there is no transmission path error, a decoded signal is in agreement with the local decoded signal of the prediction-coding device 1.

0032 Namely, in a flat part with little change of the horizontal synchronization section etc. and a picture. Since a prediction error signal serves as small-size width, the prediction signal of a prediction device comes true well and quantization noise is not generated by small-size width according to the quantization characteristic of drawing 2, the decoded signal which prediction-coding decryption was carried out and was reproduced is in agreement with an input PCM signal. In other words, information preservation is carried out and it is coded.

0033 Even if there is a transmission path error, in order to decrypt correctly, it is necessary to stop propagation of an error. In order for an error to leak gradually and to make it set to 0, one method makes the profit of a prediction device a value smaller than 1, and performs leak integration. Namely, what is necessary is just to make the profit of the dc component of a prediction device smaller than 1. for this reason -- being alike -- for example, if it is not the above-mentioned thing, $k= (1-2^{-4})$ is hung on a change as leakage coefficient k and the function of $P= (1-2^{-4}) (0.5Z^{-1}+Z^{-3}-0.5Z^{-4})$ is used as a prediction function, Even if there is a transmission path error, it is leaked gradually, and is set to 0, a right decoded signal is acquired, and the decoded signal of the error signal contained in a decoded signal corresponds by transmission and reception.

0034 Another method is reset so that it may become the initial value which was able to determine

the value of the register of the prediction device of the transmitting side and a receiver the suitable cycle, and it is made for its following prediction signal to correspond by transmission and reception. responding to the occurrence frequency of an error of a transmission line -- a frame -- 1 time and tens of lines -- 1 time -- it carries out. What is necessary is just to perform reset for error transmission inhibition independently, and it is not necessary to perform it by being in agreement in each stage of prediction-coding decryption. When the error rates of a transmission line differ in each stage, you may reset a cycle which is different from the 1st step in the 2nd step.

0035 The decoded signal acquired by coding decryption being carried out with the 1st step of the prediction-coding device 1 and the prediction-coding device 2 is supplied to the 2nd step of the prediction-coding device 3 and the prediction decoding device 4, and coding decryption is performed.

0036 The prediction-coding device 3 and the prediction decoding device 4 perform the same operation with the same composition as the 1st step of prediction-coding device 1, and the prediction decoding device 2. That is, the subtractor 11 of the prediction-coding device 3, the quantizer 12, the adding machine 13, the prediction device 14, the quantization circuit 15, and the signal converter 16 carry out the same operation with the same composition as each part of the 1st step of prediction-coding device 1. Similarly, the numerals inverter 21 of the prediction decoding device 4, the adding machine 22, the prediction device 23, and the quantization circuit 24 carry out the same operation with the same composition as each part of the prediction decoding device 1.

0037 In **since the place with few signal changes carries out information preservation and is coded by flat parts, such as the section of a Horizontal Synchronizing signal,** a flat part, The signal of the same value as the PCM signal inputted into the 1st step of prediction-coding device 1 is acquired by the output of a prediction decoding device, and is again inputted as an input PCM signal of the 2nd step of prediction-coding device 3.

0038 That is, in a flat part, from an input signal being in agreement, the value of the internal register of the prediction device 14 is in agreement with the 1st step in the 2nd step, and the 2nd step outputs the same prediction signal with the 1st step after that. According to the 2nd step of input signal and the 1st step of local decoded signal being equal, the prediction error signal outputted from the 2nd step of subtractor 11 serves as a value which was in agreement with the 1st step of quantization output signal.

0039 Although a prediction error signal is supplied to the quantizer 12 and it is quantized in the quantization characteristic shown in drawing 2, the input signal with the value of a quantization output signal is the characteristic outputted as it is, and the quantization output signal of the value which was in agreement with the 1st step of quantization output signal is outputted, and it is supplied to the adding machine 13.

0040 When the prediction signal and quantization output signal which are inputted into the adding machine 13 are in agreement with the 1st step in the 2nd step, it becomes the value to which the 2nd step of the local decoded signal outputted from the adding machine 13 corresponded with the 1st step.

0041 Namely, although quantization noise was made in the 1st step, In the 2nd step, quantization noise is not generated, but a local decoded signal and an input signal are in agreement in the 2nd step of prediction-coding device 3, and the prediction decoding device 4 performs the completely same operation as the prediction decoding device 2, and decodes the signal of the same value as the local decoded signal of the prediction-coding device 3.

0042 Therefore, even if how many steps connect, it becomes the 2nd step and operation after the 2nd step, and it can acquire the same signal as an input signal as a decoded signal. That is, even if it connects with multistage, henceforth **the 2nd step** , quantization noise will be accumulated.

0043 Other examples are shown as the quantization characteristic of the quantizer 12.

0044 It is the composition which switches the 4-bit quantizers A and B by the field of a picture signal.

0045 The companding rule of the quantization characteristic A is MT (mid tread) mold symmetrical with positive/negative, step sizes are 0, 1, 1, 1, 3, 7, 15, and 31, a peak child-ized step has 59 and the number of quantization levels has the characteristic of 15. This is the quantization characteristic suitable for a flat part, and it is the characteristic outputted as a quantization output signal as it is to the prediction error (-3-3) of small-size width so that information preservation can be coded.

0046 The companding rule of the quantization characteristic B is MT type symmetrical with positive/negative, it is the step sizes 0, 1, 3, 7, 15, 29, 29, and 29, and a peak child-ized step has 1113 and the number of quantization levels has the characteristic of 15. In the characteristic suitable for the field to which a picture changes a lot, a large dynamic range is taken so that a transient response characteristic may become good.
0047 Each threshold of the input side of the quantization characteristic is taken at the middle point of the quantization level before and behind the quantization output characteristic. When the transfer characteristic of the quantization characteristic A and the quantization characteristic B is symmetrical with positive/negative and shows only a right side, it is as follows. A modulation code changes a quantization output into 4-bit numerals. S shows numerals and is 1 at 0 and the time of negative at the time of positive.
0048
Quantization characteristic A quantization characteristic B Prediction error Quantization output Modulation code Prediction error Quantization output Modulation code
0 0 0001 0 0 0001 1. 1 001S 1- 2 1 001S 2. 2 010S 3- 7 4 010S 3-. 4 3 011S 8-1811 011S. 5-9 6 100S 19-40 26. 100S 10-20 13 101S 41-69 55 101S 21-43 28 110S 70-98 84 110S 44- 59 111S 99- 113 It divides into the horizontal synchronization section and the picture section in 111S1 horizontal scanning, and the quantization characteristic is switched. In the horizontal synchronization section, it enables it to initialize a prediction device by the flat part of the horizontal synchronization section using quantization in the quantization characteristic A, and a transient response performs good quantization using the quantization characteristic B in the picture section.
0049 The example of composition of the prediction-coding device 70 of this invention in the case of switching the quantization characteristic and the prediction decoding device 80 is shown in drawing 4.
0050 The prediction-coding device 70 is constituted like the prediction-coding device 1. The synchronizing separator circuit 71 performs synchronizing separation from an analog picture signal or a digital image signal, searches for a Horizontal Synchronizing signal, generates the control signal of a change in the control circuit 72, and controls the change machine 75 of the quantizer 76. The quantizer A has the quantization characteristic A and the quantizer B has the quantization characteristic B. The signal converter 77 adds and outputs synchronization information so that the timing of a change may be known, while changing a quantization output into a modulation code.
0051 The prediction decoding device 80 is constituted like the prediction decoding device 2. The numerals inverter 78 separates synchronization information, generates the control signal of the timing of a change in a control circuit, and outputs the quantization output of the quantization characteristic A or the quantization characteristic B from a modulation code according to a switching signal in a numerals inverter.
0052 Henceforth **the 2nd step** , the composition which synchronizing separation is carried out from a digital image signal, and also acquires the information on a synchronized signal from the 1st step of control circuit 79 is also possible for the synchronizing separator circuit 71.
0053 The composition of this change has few quantifying bit numbers, and is effective as the quantization for the information preservation to the signal which turns into a prediction error signal of small-size width in the horizontal synchronization section, and the quantization characteristic of satisfying both which perform large quantization of a dynamic range in the picture section.
0054 If a prediction function changes also with a sampling frequency and correlation of the field or a frame is used, it can perform still more efficient prediction.
0055 According to the composition which adds 0.5 to a prediction signal and omits below a decimal point, the quantization circuit 15 can be rounded off. However, since an adding machine is needed with this composition, as a method of sharing the adding machine of a prediction device, If 0.5 is added and put on the local decoded signal of an integral value inputted into the prediction device 14 as a dc-component signal (1 bit is added under a decimal point and it is considered as a high level signal), By only omitting below a decimal point in the quantization circuit 15, the prediction signal acquired from the prediction device 14 can be rounded off equivalent.
0056 If variable length coding is used for a change of equal-length-code-izing, encoding efficiency will go up by a signal converter further.
0057 Although the data compression of the composition of multi stage connection is carried out to

a digital video tape recorder and it transmits digitally a broadcasting signal besides in the case of writing in coding data to it, When acting as intermediary and transmitting digitally with the check and editing work of a picture signal in an intermediate relay station, it becomes the composition of the multistage of prediction-coding decryption, and the method of this invention becomes effective.

0058
Effect of the Invention When a prediction-coding device and a prediction decoding device were connected to multistage, needed to synchronize this invention with each prediction-coding device and the prediction decoding device like a conventional example, and it needed to carry out initialization of each prediction device, but. In this invention, by flat parts, such as a Horizontal Synchronizing signal, the same signal as an input signal enables it to obtain to a decoded signal (part), and equivalent by initialization ******. To the picture signal by which prediction-coding decryption was carried out in the 1st step, even if it repeats prediction-coding decryption henceforth **the 2nd step** , henceforth **the 2nd step** , the prediction-coding device quantization noise can be prevented from accumulating at all can be provided.

Industrial Application This invention about the prediction-coding device of a system and prediction composite-ized device which repeat coding decryption to multistage and carry it out to carrying out prediction coding of the TV signal, and transmitting it, It is related with the prediction-coding device and prediction composite-ized device which were carried out as **accumulate / henceforth / the 2nd step / the quantization noise by prediction coding / even if it connects with multistage especially on a digital basis and repeats coding decryption / nothing** .

Description of the Prior Art The signal of the coding compression data produced by carrying out prediction coding of the TV signal is once recorded on a digital video tape recorder (video tape recorder), The compressed data signal recorded from VTR after that is read and decrypted, When editing a decoded signal, carrying out prediction coding again and recording on VTR, there was a fault of increasing whenever prediction-coding decryption will be repeated by multistage on a digital basis and the quantization noise in prediction coding repeats dubbing with VTR.
0003 Even if it connects with multistage as a method of improving this, henceforth **the 2nd step** , methods which the quantization noise by prediction coding does not accumulate include the prediction-coding device shown in JP,S58-114683,A.
0004 In this conventional example, there was the necessity of initializing all the prediction devices synchronously.
0005 The composition of a conventional example is explained using Drawings. The quantization characteristic of the quantizer 211 is shown in drawing 6, and the example of specific constitution of the prediction device 213 is shown for the block configuration of a conventional example in drawing 5 at drawing 7.
0006A compound color television signal is sampled by a subcarrier 3 times the frequency of a color with A/D converter 205, The prediction error signal e is searched for with the subtractor 210 of the prediction-coding device 201, and it is quantized according to the quantization characteristic of drawing 6 with the quantizer 211, and is sent to the signal converter 216 and the adding machine 212. If a local decoded signal is searched for with the adding machine 212, according to a prediction function, the predicted value of the next sampling time will be calculated by the prediction device 213. there are the following Z function, $P=0.5Z^{-1}+Z^{-3}-0.5Z^{-4}$, and a thing come out of and shown as the good prediction function P of predictive efficiency. The example of specific constitution with this prediction function of the prediction device 213 is shown in drawing 7.
0007 When multi stage connection is carried out, in order to synchronize the initial value of a prediction device, initialization of the registers 232-235 of a prediction device is performed. The signal of Xa of a value or Xb beforehand provided in the input terminal of B of a register as an initial value whenever Horizontal Synchronizing signal H was inputted is incorporated.

0008 In the signal converter 216, a quantization output is changed into a modulation code, and is outputted, and it sends to the prediction decoding device 202. The numerals inverter 217 reproduces a quantization output signal from a modulation code, searches for a decoded signal with the adding machine 214, and sends it to the prediction-coding device 203 of the following stage, and it is sent to the prediction device 215 and the following prediction signal is searched for. The prediction device 215 is the same composition as the prediction device 213, and initialization is performed for every start of a Horizontal Synchronizing signal. It is the composition as the prediction decoding device 202 in which the prediction-coding device 201 and the prediction decoding device 204 of the prediction-coding device 203 are the same respectively, and the same operation is performed and initialization of a prediction device is performed for every start of a Horizontal Synchronizing signal.
0009 This performs coding processing in the completely same operation as having been performed by the prediction-coding device 201 with the prediction-coding device 203, In accordance with the local decoded signal with which the local decoded signal outputted from the adding machine 222 is outputted from the adding machine 212 in accordance with the quantization output signal with which the signal outputted from the quantizer 221 is outputted from the quantizer 211, this is in agreement with an input signal. ** which became that the prediction decoding device 204 performed by the prediction decoding device 202 similarly -- the same operation is repeated, decoding processing is performed and the decoded signal outputted from the adding machine 224 is in agreement with the local decoded signal outputted from the adding machine 222.
0010 That is, if the 1st step of decoded signal is put in another way, the 2nd step of input signal is in agreement with the 2nd step of decoded signal. That is, even if it connects with multistage, henceforth **the 2nd step** , the quantization noise by prediction coding accumulates nothing.

Effect of the Invention When a prediction-coding device and a prediction decoding device were connected to multistage, needed to synchronize this invention with each prediction-coding device and the prediction decoding device like a conventional example, and it needed to carry out initialization of each prediction device, but. In this invention, by flat parts, such as a Horizontal Synchronizing signal, the same signal as an input signal enables it to obtain to a decoded signal (part), and equivalent by initialization ******. To the picture signal by which prediction-coding decryption was carried out in the 1st step, even if it repeats prediction-coding decryption henceforth **the 2nd step** , henceforth **the 2nd step** , the prediction-coding device quantization noise can be prevented from accumulating at all can be provided.

ExampleNext, this invention is explained with reference to Drawings.
0019 The block configuration of one working example of this invention is shown in drawing 1.
0020 It is sampled by the 8-bit PCM signal (value of -128-127) by the subcarrier fsc (3 and fsc) 3 times the frequency of a color, and the NTSC compound color television signal inputted into A/D converter 5 is a subtractor of the prediction-coding device 1.

Problem(s) to be Solved by the Invention In the conventional example mentioned above, initialization of the prediction device of each device is **cycle defined beforehand** required for this method, and the means of this initialization, When the system which repeats a prediction-coding device and a prediction decoding device, and is connected to multistage was constituted, it became limitations, and there was a fault that the means of initialization was required and there was.
0012 This invention provides the prediction-coding device which abolishes the fault of conventional prediction device coding equipment. Namely, even if the purpose of this invention does not process initialization of a prediction device with each prediction-coding device synchronizing with the case where it is connected to multistage, To the picture signal by which prediction-coding decryption was carried out in the 1st step, when prediction-coding decryption is repeated henceforth **the 2nd step** , there is quantization noise by prediction coding in providing the prediction-coding device

which nothing can accumulate.

Means for Solving the Problem In a device which according to the invention according to claim 1 uses a prediction-coding device and a prediction decoding device for coding a picture signal, connects with multistage on a digital basis, and repeats coding decryption, According to the same characteristic as a prediction function used by prediction coding of the preceding paragraph, a prediction signal is acquired from a local decoded signal, A means to quantize a value below a decimal point of a prediction signal, and to output a prediction signal as an integral value when a coefficient of a prediction function has a value below a decimal point and a prediction signal has a value below a decimal point, A means to subtract said prediction signal from an input picture signal, and to acquire a prediction error signal, A value as it is is outputted to a quantization input signal of a value equal to a quantization output level of the quantization characteristic used by said prediction coding, A quantization means to which amplitude of a prediction error signal has the quantization characteristic which outputs a signal of the same accuracy as an input signal in the small range, quantizes said prediction error signal, and outputs an integral quantization output signal in order to make it a local decoded signal become equal to an input signal in a flat part of the horizontal synchronization section, In a process in which have a means to code and send out said quantization output signal, and a means to acquire said integral local decoded signal from said quantization output signal and said prediction signal, and repeat prediction-coding decryption to multistage and it is performed on a digital basis. Henceforth **the 2nd step** , a prediction-coding device characterized by making it quantization distortion by prediction coding accumulate nothing is obtained.

0014 In a prediction-coding device including a prediction error signal quantization means which according to the invention according to claim 2 quantizes a prediction error signal of an integral value and generates a quantization output signal of an integral value, Said prediction error signal quantization means outputs this prediction error signal as said quantization output signal as it is in the range with small amplitude of said prediction error signal, And to said prediction error signal of a value equal to said quantization output signal, a prediction-coding device being what has the quantization characteristic which outputs a value as it is is obtained.

0015A subtraction means which according to the invention according to claim 3 subtracts a prediction signal of an integral value from an input picture signal, and generates a prediction error signal of an integral value, A prediction error signal quantization means which is generated by this subtraction means, quantizes a prediction error signal of said integral value, and generates a quantization output signal of an integral value, An adding means which adds a quantization output signal of said integral value generated by this prediction error signal quantization means, and a prediction signal of said integral value, and generates a local double sign signal of an integral value, A prediction means which generates a prediction signal which has a value below a a small number of point according to a predetermined prediction function from a local double sign signal of said integral value generated by this adding means, A prediction signal quantization means which quantizes a prediction signal which has a value below said a small number of point generated by this prediction means, generates a prediction signal of said integral value, and supplies a prediction signal of this integral value to said subtraction means and said adding means, Have a code translation means to change said quantization output signal into a modulation code, and to send it out, and said prediction error signal quantization means outputs this prediction error signal as said quantization output signal as it is in the range with small amplitude of said prediction error signal, And to said prediction error signal of a value equal to said quantization output signal, a prediction-coding device being what has the quantization characteristic which outputs a value as it is is obtained.

0016A numerals inverse transformation means to reproduce said modulation code sent from the prediction-coding device according to claim 3 to a quantization output signal according to the invention according to claim 4, An adding means which adds said quantization output signal acquired by this numerals inverse transformation means, and an integral prediction signal, and generates a double sign signal, A prediction means which generates a prediction signal which has a value below a a small number of point from said double sign signal generated by said adding

means according to the same prediction function as said prediction function which said prediction means provided in the prediction-coding device according to claim 1 has, A prediction signal which has a value below said a small number of point generated by this prediction means is quantized, a prediction signal of said integral value is generated, and a prediction double sign-ized device having a prediction signal quantization means which supplies a prediction signal of this integral value to said adding means is obtained.

0017 According to the invention according to claim 5, a coding double sign-ized system of a TV signal having the prediction-coding device according to claim 3 and the prediction double sign-ized device according to claim 4 in multistage is obtained.

Brief Description of the Drawings

Drawing 1 The block diagram showing the composition of one working example of this invention.

Drawing 2 The figure showing the concrete characteristic of the quantizer 12 of working example of drawing 1.

Drawing 3 The figure showing the example of specific constitution of the prediction device 14 of working example of drawing 1.

Drawing 4 The block diagram showing the composition of the prediction-coding device of other working example of this invention.

Drawing 5 The block diagram showing the composition of conventional working example.

Drawing 6 The figure showing the example of the concrete characteristic of the quantizer 211 of conventional working example of drawing 5.

Drawing 7 The figure showing the example of specific constitution of the prediction device 213 of conventional working example of drawing 5.

Description of Notations

1, 3, and 70 Prediction-coding device
2, 4, and 80 Prediction decoding device
11, a subtractor
12 and 76 Quantizer
13 and 22 Adding machine
14 and 23 Prediction device
15 and 24 Quantization circuit
16 and 77 Signal converter
21 and 78 Numerals inverter

Drawing 1

For drawings please refer to the original document.

Drawing 2

For drawings please refer to the original document.

Drawing 3

For drawings please refer to the original document.

Drawing 5

For drawings please refer to the original document.

Drawing 6

For drawings please refer to the original document.

Drawing 7

For drawings please refer to the original document.

Drawing 4

For drawings please refer to the original document.

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